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ABSTRACT

Analysis indicates that the appropriate time lag between cause and effect--between presentation of a press agenda and learning of issue saliences--is from two to six months, with a four-month lag being generally acceptable for newspaper agenda-setting. A shorter lag appears more appropriate for television agenda-setting. Within the framework of agenda-setting research, this paper demonstrates the need for more precise theorizing, methodologies, and identifying of causal relationships in nonexperimental settings. Cross-lagged correlation is illustrated as one technique for empirically identifying the appropriate time lag and aiding in the development of agenda-setting theory. It is concluded that further research should focus on specifying the causal process suggested in the agenda-setting theory of media effects, as well as on developing new methods for measuring and relating media and public issue agendas. (RB)

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Measuring the Cumulative Agenda-Setting Influence of the Mass Media

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Measuring the Cumulative Agenda-Setting Influence of the Mass Media

Communication researchers have joined their colleagues in sociology and social psychology in the development of new approaches to testing causal relationships in non-experimental situations. This panel is an indicant of this interest; similar panels have become almost commonplace at communication conventions.

Despite this interest, however, the implications of these new techniques for theory development in communication have not been given much attention. Yet the statistical and logical assumptions inherent in the techniques both make demands on theorists and place limitations on the kinds of statements they can make.

Recent advancements in development of a theory of communication effects under the general rubric of agenda-setting provide a framework for examination of the impact of one of these new techniques -- cross-lagged correlation -- on theory. Data available allow us to make some important decisions about what a theory of these effects should look like in terms of the required time-span for observation of the effects and the cumulative nature of the effect itself.

Background

Campbell and Stanley (1963) discuss correlational analysis in terms of its power for disconfirmation of posited hypotheses. Correlation does not imply causation, they note, but if a high correlation between two variables occurs, the credibility of the hypothesis is strengthened in that it has survived a chance of disconfirmation. If a zero correlation is obtained, the credibility of the hypothesis is greatly diminished.

In communication research two types of correlational data predominate. In the first and most common case, measures of some set of variables are obtained for a given group of analysis units, usually individual respondents to a field interview schedule, and correlations between the variables calculated. This, of course, is the simple cross-sectional design. In the second case, a single unit of analysis, usually a country or other political entity, is assigned values on two or more variables at a set interval, for a given number of intervals, and the correlation calculated between these measures across the time period. This is a time series analysis design, so common in economics.

Introducing the cross-sectional design measurement of the same unit of analysis at more than one time point

allows for a new set of correlations between data from time one and data from time two. This new data, coupled with the key assumption that an effect should correlate higher with a prior cause than with a subsequent cause, is the central element of the cross-lagged technique. In terms of Figure I, this means that rX_1Y_2 should be greater than rX_2Y_1. The Campbell and Stanley logic, spelled out here, parallels that used by Lazarsfeld around 1948 in a mimeographed report on the relationship between two dichotomous variables over a time.* Campbell and Stanley appear to have pinned the title "time lagged correlation" on the technique.

Traditionally, the single-unit, repeated measure correlational data from time series studies has been analyzed in a manner ignoring the temporal strengths of the data. Campbell (1963), however, suggested that the simple correlational analysis of this type parallels the time series, quasi-experiment. Central to both the correlational and experimental techniques is the observation of change in the dependent variable co-occuring with change in the independent variable. In the time series case, this finding is plagued by the questions of the direction of causality and the existence of a third variable causing both the presumed independent and dependent variables.

*The unpublished Lazarsfeld paper is discussed at length in Campbell and Stanley (1963).

Campbell argues, however, that "...through an absence of plausible rival hypotheses, in some cases, a temporal correlation is unambiguously interpretable..." (p. 230). To illustrate what Campbell is arguing, we would have little difficulty in choosing the hypothesis that rainfall caused a rise in wheat prices rather than the hypothesis that wheat prices caused rain if we observed a consistent correlation between the two variables, simply because one hypothesis a priori is very unlikely. Such clear-cut relationships, however, are infrequent in communication research.

Campbell (1963) has suggested that a lagged technique also can be employed to gain information about causal ordering of variables from time series data. Relying on the above stated reasoning that a cause at time one should correlate higher with an effect at time two than an effect at time one correlates with a cause at time two, he suggests lagging the series correlations and comparing the supposed time one cause and time two effect relationship with the time one effect and time two cause relationship. In other words, the magnitude of two cross-lags are compared.

Statistical Assumptions for the Use of Correlations

In both the time lagged and the simple time series analyses, basic assumptions must be made in order to employ the standard measure of covariation, the Pearson Product Moment Correlation Coefficient. (However Pelz and Andrews, 1964, used a nonparametric statistic; and some of the data presented in this paper are based on nonparametric statistics.)

For use of Pearson r, in addition to the requirement that the data be measured on a scale with equal intervals, the relationship between these two variables is assumed to be linear, each variable must be normally distributed, and the relationship between the variables must be homoscedastic. The latter requirement is that the spread of variance about the best fitting straight line through the distribution is approximately the same at all levels of the two variables. When these assumptions are met, the relationship is said to be bivariate-normal. Nunnally (1967) and McNemar (1969) argue, however, the correlation statistic is robust and these assumptions need not be met provided the violation is not extreme.

A simple scatter plot of the data can be helpful in itself in estimation of linearity, normality, and homoscedasticity.

An additional assumption of the mathematical model

used to fit a line through the distribution of the relationship between two variables is particularly important for time series data. Wonnacott and Wonnacott (1969) note that the model, specified by the equation

$$Y = \alpha + \beta X + u$$

where u is the error or disturbance term, requires that each value of the specific variable entered into the analysis must be independent of the other values of that variable around it. In other words, Y_1 is not affected by Y_2 and Y_2 is not affected by either Y_1 or Y_3. Only when this is true will u have a normal distribution, as is required for maximum likelihood estimation of elements of the model. But in time series data this assumption will rarely be completely satisfied since the same unit of analysis is used across time measurements. In other words, the design is a repeated measures one, with all the observations taken on the same "individual." It is therefore unlikely that the disturbance term (u) in the equation specifying the relationship between X and Y will be random. This occurrence is referred to as autocorrelation. The autocorrelation would be expected to distort the correlation (probably exaggerating it) between the two variables.

Recent Developments in Cross-Lagged Techniques

Recent developments in cross-lagged analysis have both increased the sophistication of the technique and the understanding of its limitations. Pelz and Andrews (1964), working primarily from the Campbell discussions, have isolated five elementary assumptions necessary for the analysis.

First, it must be assumed that the variable X_1 (the presumed cause) in Figure I does not become constant, but rather continues to change over time. If this were not the case, the comparison specified by Campbell (between rX_1Y_2 and rX_2Y_1) becomes less meaningful. (Essentially, this leaves only the comparison between rY_1Y_2 and rX_1Y_2. Since an item will almost certainly correlate better with itself over time than with the cause, there is little valuable information available.) This assumption, then, requires that relationships studied be ongoing ones, which is the usual case in social research. (It is important to realize that while the computational assumption is merely that variable X changes, the logical assumption is that such change is real and not due to measurement unreliability. That this is so will become clearer as the discussion proceeds.) Since the expectation is that variable X is under the control of other outside variables

at time 1 (otherwise it would not be expected to change between time 1 and time 2), the nature of that relationship becomes important. If variable Z is the sole cause of changes in variable X, and a saturation effect occurs such that at some point Z no longer changes X, use of cross-lags would be inappropriate.

There is an additional circumstance for which the X_1 to X_2 correlation will be prohibitively large, causing problems in interpretation of time-lagged panel data. If mean changes in the panel from time 1 to time 2 do occur, but the amount of change is constant across all units of the panel, perfect correlation between X_1 and X_2 will result, making cross-lagged comparisons meaningless.

A second assumption discussed by Pelz and Andrews has to do with the interval chosen for time lags. Since the expectation is that rX_1Y_1 is less than rX_1Y_2 (if X_1 is caused by some Z and Y_1 is caused by a prior X but Y_2 is caused by X_1), then some measure of Y prior to the impact of X_1 on Y must be obtainable. This requirement that the causal impact not be instantaneous probably is not too limiting for communication research, where most effects are cumulative rather than immediate. Yet it is part of the larger problem of determination of the proper time lag which serves as a major thrust of this paper. The problem will be discussed in more detail later.

The third Pelz and Andrews assumption is a check on the first, requiring that while X should be inconsistent over time, it should not be too inconsistent. No problem will arise due to inconsistency if the causal sequencing is correct, i.e., if the lag corresponds to the true one required for X to effect Y. But if the lag is incorrect, the calculation of the cross correlations (rX_1Y_2 and rX_2Y_1) will be incorrect due to improper exclusion of the second wave variables. In other words, the correlations would be weakened by exclusion of an intermediary step. To the extent, however, that the true lag for X and Y is the same, this overestimation of that lag would not disturb the relative comparisons of the cross-lagged correlations.

The fourth assumption listed by Pelz and Andrews is really an extension of the third. If the simultaneous correlations between X and Y do not hold relatively constant over the time ($rX_1Y_1 \neq rX_2Y_2$), the predicted inequalities between the cross-lagged correlations (rX_1Y_2 and rX_2Y_1) might not hold. In other words, there cannot be qualtiative differences in the relationship between the two variables across the time lag. It must be assumed that the researcher has entered the ongoing relationship at a point during which no major change in the nature of that relationship is taking place.

The final Pelz and Andrews assumption is that of linearity. Not only is this necessary, as they note, for

computation of the product moment correlation coefficient, but it will also be necessary to meet the first, third and fourth assumptions.

Rozelle and Campbell (1969), in commenting on the Pelz and Andrews work, note that the test for differential impact of X and Y on each other makes an elementary assumption that may not be easily met. Essentially the test of rX_1Y_2 vs. rY_1X_2 assumes that, if one r is greater than the other, the smaller coefficient is mostly spurious. But, Rozelle and Campbell note, rX_1Y_2 will be greater than rY_1X_2 if the positive effect of X_1 on Y_2 plus the negative effect of Y_1 on X_2 is greater than the positive effect of Y_1 on X_2 plus the negative effect of X_1 on Y_2. In other words, the simple test of the relative size of the cross-lag correlations is not as straight-forward as first thought, and the findings may be confounded beyond interpretation if only the cross-lag comparisons are made.

Rozelle and Campbell argue, however, that knowledge of rX_1X_2 and rY_1Y_2 and of rX_1Y_1 and rX_2Y_2 allow for computation of a cross-lag baseline which helps clarify the confound problem. Via the baseline the researcher is given a no-cause minimum correlation against which to check both for X_1 causes Y_2 and Y_1 causes X_2. It remains possible, however, that both the rX_1Y_2 and rY_1X_2 correla-

tion will be greater than the baseline, indicating the effects of X and Y on each other. Interpretation of these baseline comparisons is confounded, however, by the lack of a criterion against which to test deviation from the baseline. No statistical test is presently available. Bohrnstedt (1969), arguing that the best predictor of either X or Y at time two will be the respective time one measures, also offers a complicated partial formula that allows the researcher to pull out the effect of the time one measures. This partial is like the Rozelle and Campbell baseline in that it allows for fuller interpretation of the cross-lagged correlations.

The Bohrnstedt emphasis on partialling out the time one measures, as well as the earlier simple partialling by Pelz and Andrews (1964) and the inherent partialling in the Rozelle and Campbell baseline, are important additions to the cross-lagged technique. The intent of these techniques is to eliminate all possible exogenous variables (Z) that might create spurious X_1Y_2 or Y_1X_2 correlations.

If X_1 and Y_1 were spuriously correlated only because of some common cause (Z), then partialling out Y_1 from the X_1Y_2 correlation should reduce it to near zero. What remains when this correlation does not go to zero is the

effect of X. No Z variable occurring after time one can spuriously create a X_1Y_2 correlation since that Z cannot effect X_1. This partialling can be successful, however, only to the extent that the lag for the effect of Z on X and Y is the same. When this assumption is not met, the partialling may not be successful in eliminating the spurious Z effects.

Duncan (1969), Heise (1970), and Pelz and Lew (1970) have extended work on path analysis to time lagged data in a more formal statement of the partialling technique. Heise (1970) argues that the correlation between X_1 and Y_2 as well as the correlation between Y_1 and X_2 are not merely functions of the underlying parameters, path Y_2X_1 and path X_2Y_1 respectively. Specifically, this comparison of raw correlations could be upset if the stabilities of X and Y were moderately different. Essentially, this is the same partialling argument used by Pelz and Andrews (1964), Rozelle and Campbell (1969) and Bohrnstedt (1969). Heise, however, prefers the path coefficients over partials

> "...since these are estimates of parameters in a specific model of change, whereas the partial correlations estimate no such parameters in any model yet proposed for panel data." (p. 10)

Out of the 12 logically possible paths in a four variable system, four can be eliminated immediately because of the time dimension since later states cannot

determine earlier states.* The assumption of the existence of something other than an instantaneous causal link between X and Y allows for the elimination of still four more paths.** While it is assumed that X_1 and Y_1 are not causally related, they can be correlated. In fact, Heise notes, such a relationship would be expected because of the past effect of X on Y. In addition, two new variables are introduced into the system, each indicating the outside disturbances on X_2 and Y_2 during the time lag. The inclusion of these hypothetical variables indicates that while part of the variance in X_2 and Y_2 is interpretable in terms of the X_1 and Y_1 paths, other variables have been acting upon both X_2 and Y_2. The path model, adapted from Heise's, is shown in Figure II.

Acceptance of the path framework requires the following additional assumptions listed by Heise: (1) Noncolinearity -- that correlations among the variables are not so close to 1.00 that it is difficult to separate the effects of one variable from another; (2) Constancy -- that the causal relations in the system operate continuously and that the structure of the relationship does not change with time; (3) Equivalence -- that all units of the sample are subject to the same causal laws; (4) Equal Causal Lags -- that the time lag period for all relationships

*Eliminated, in Figure II, are: pX_1X_2; pY_1Y_2; pX_1Y_2; pY_1X_2.

**Eliminated are: pX_1Y_1; pY_1X_1; pX_2Y_2; pY_2X_2.

is about the same; (5) Measurement Error -- that it is absent, and (6) Disturbances -- that the variables outside the system in time two are unrelated to time one variables.

While the last two assumptions seem unlikely to ever be met, Heise, using siumlation data, goes on to demonstrate that violation of these two assumptions does not affect inferences about the existence of the relationship between X and Y, but it can have adverse effects on parameter estimation.

The Time Lag

The assumptions discussed to this point are listed in Figure III. In both cross-lag and time series data, the most important decision concerns selection of the proper time lag. While cross-lag and time series techniques are appropriate methodologies <u>in general</u> for generating evidence about causal processes, the likelihood of obtaining interpretable or unequivocal answers about the nature and direction of the causal effects is dependent upon the methodology being applied to the <u>appropriate time intervals</u>. Where the theoretical conceptualization of the process does not state in specific terms, at least tentatively, the nature of the time lag between cause and effect, the researcher simply must guess where to plug in his empirical observations and collect the data needed for

cross-lag or time series analysis. In short, application of any methodology designed to yield causal evidence is constrained by the state of the theory about the process being studied.

Too often discussions of the theory and methodology of mass communication research proceed in isolated, water-tight compartments. In those all too rare instances where they are brought into parallel, the focus is on the constraining effects of method on theory testing and development. For example, the greatly increased attention to cross-lag and time series data among communication scientists in recent years stems from a growing awareness that cross-sectional data and the usual techniques of analysis applied to it are too static to support the causal assertions of our hypotheses about the process and effects of mass communication.

But just as methodology can constrain our theoretical efforts, it is equally the case that the state of theory can limit our successful applications of even the most sophisticated methodologies. In the past this clearly has been the case in research on the agenda-setting function of mass communication. The central idea of agenda-setting is that the mass media through their day-to-day selection and display of news influence our perceptions of what are the important problems and issues of the day.

Agenda-setting asserts that audiences learn these saliences from the news media, incorporating a similar set of weights into their personal agendas. While the production of these saliences is largely a by-product of journalism practice and tradition, they nevertheless are attributes of the messages transmitted to the audience. And, asserts the idea of agenda-setting, they are among the most important message attributes transmitted to the audience.

This concept of the agenda-setting function of the mass media is a relational concept specifying a strong positive relationship between the emphases of mass communication and the salience of these topics to the individuals in the audience. This concept is stated in causal terms: increased salience of a topic or issue in the mass media influences (causes) the salience of that topic or issue among the public.

While a great deal of correlational evidence supporting the idea of an agenda-setting function has accumulated in the literature (McCombs and Shaw, 1972, 1974; Becker, McCombs and McLeod, in press), direct causal testing of the agenda-setting hypothesis has been difficult. Tipton, Haney and Basehart (1975) applied cross-lagged correlational analysis to panel data from the 1971 Kentucky gubernatorial election in an effort to test the causal assertions of agenda-setting. However, the equivocal outcome of much of their analysis results in large

part from the particular time interval selected. In the absence of any theoretical guidance regarding the appropriate time lag to use, they had to use the convenient logic of the calendar, and so collected data during October and again in November.

Most of the writers who have dealt with cross-lagged correlations and/or time series data have expressed concern about the problem of determination of the proper lag. Pelz and Andrews (1964) discuss the difficulty in determining causal ordering when one variable changes over a regular cycle, returning to exactly the same value after a given number of units. Blalock (1964) notes that reciprocal causality may cause improper inferences, particularly if the lag is chosen so that only one step of the causation has taken place. If reciprocal causality occurs within the chosen time lag, however, improper inferences are unlikely to occur since X_1Y_2 and Y_1X_2 should both be large and above the Rozelle and Campbell baseline.

Another case in which improper selection of the time lag could lead to faulty inferences results from the impact of the possible Z variables. If some Z variable has a differential lag for its impact on X and Y, such that its effect on X was felt at time one but its effect on Y was not felt until time two, the X_1Y_2 correlation would be spurious. None of the partialling techniques could eliminate such a possibility, which would produce a large X_1Y_2 correlation due merely to the common cause.

Selection of what may be too short a time lag also severely restricts the power of the cross-lagged technique, leaving the researcher unable to show any effect for the independent variable.

In the case of agenda-setting, designation of the time lag between the media's promulgation of an agenda of issues and the public's acceptance of these issues as the salient topics of the day is a key substantive question which the theory must address. Once the idea of an agenda-setting influence of the press is even tentatively accepted, an obvious next question is: How long does it take the public to learn the press' agenda? Over what period of time does the learning of salience take place?

Answers to these questions are also important methodologically. What represents appropriate data for cross-lagged or time series analysis? Across what time interval can we best capture the agenda-setting process in our statistical analyses?

Cumulative Effect of Mass Communication

Knowledge of the time required for the mass media to bring a topic to the public's attention, to place an item on the agenda, is important to agenda-setting theory both from a substantive and methodological standpoint. There are two key questions: What is the time lag between

appearance of an item on the media's agenda and its appearance on the public agenda? Over what length of time does the cumulative impact of mass communication build up? Both questions are important, both for the descriptive precision of the theory and for methodological decisions about what time span the researcher should content analyse.

Some preliminary answers to these two questions are already in hand. Using the personal agenda topics from the 1973 Syracuse Sophomore Study and from the 1972 Charlotte Voter Study - both designed as agenda-setting projects* - coders worked with issues of Time and Newsweek magazines to determine the media agendas for six months before and three months after the dates of the fieldwork.

When the media content is combined in systematic monthly increments with the Syracuse sophomore's public agenda, a striking pattern of stability results in the Pearson correlations between media and public agendas. In Figure IV the correlations increase monotonically as the time span cumulates backward in time from the interview period. There is a rapid rise in the correlation coefficients

*The Syracuse Sophomore Study, conducted in the fall of 1973, is one of the few non-election campaign studies of agenda-setting. That study interviewed a random sample of 302 male sophomores on the Syracuse University campus. Beyond the convenience of this sample design, it yielded good controls on sex, age, and level of education. The analysis presented here has been reported in greater detail by Stone (1975). In contrast, the Charlotte Voter Study interviewed a panel of 227 randomly selected registered voters in Charlotte, North Carolina in June, October and November of 1972. Obviously, these respondents are quite varied demographically.

from the interview period to a time two months prior to the interviews. After that, the correlations continue to increase but at a much diminished rate.

In all, the maximum time frame during which the media agenda best matches the public agenda is a four-month period extending from six months to two months prior to the interview period.

The pattern of correlations also demonstrates that more than the cumulative impact of mass communication is involved. There definitely is a time lag in the movement of issue saliences from the media agenda to the public agenda.

In Figure IV, the cumulative three-month impact of media yields an r of +.67. The correlation based on the media content for only two months prior -- no cumulation -- is +.72, essentially the same. Going back three months, the cumulative r is +.85 and the isolated r, +.77, again highly similar.

However, given a two to three month lag, other patterns in Figure IV demonstrate the cumulative effects of mass communication across time.

Had the proof of the hypothesis rested on the sophomore data alone, we could accept a period from six months to two months before the interview period as the optimal agenda-setting period. But the Charlotte data modify this finding.

Data based on the June wave of the Charlotte study presented in Figure V show patterns moderately similar to those of the Syracuse study. In fact, the correlation of +.42 for the period from five months to two months before the interviews is the single highest correlation. But the smooth, monotonic pattern of the Syracuse study is absent.

Data based on the October wave, presented in Figure VI, also show some inconsistencies, especially in the data including the October media content. This first set of agenda-setting correlations shows no cumulative time trend at all. But there is a cumulative, monotonic trend in the other three sets in Figure VI. The strength of the correlations is similar to the Charlotte June wave, but much weaker than for the Syracuse Sophomore Study.

Most likely, the key to the differences in these patterns, especially the differences in the strengths of the correlations, lies in the social context. The Charlotte data is taken from a Presidential campaign, a time when politics is terribly salient to the media if not to all the electorate. In contrast, the Syracuse survey was taken among students during a period when no election was on the horizon. The political issues of the day, salient to both media and students alike, were the Middle East War -- the kind of event that moves rapidly onto everyone's agenda -- and Watergate -- an issue with which the media had labored for over a year to place on the national agenda.

In short, we are comparing a period when the political field was largely left to the media with an election period both when numerous other forces are at work on voters' agendas and when the high salience of politics for the media generally outweighs its salience among the electorate.

The overall result was to attenuate the correlations in the campaign period, but not to remove the cumulative pattern of mass communication impact on personal agendas except at the height of the political campaign. This initial effort documents the cumulative impact of the press on public opinion over a two to six month period. Future replications should probe more into these situational factors, including the types of issues on the public agenda, which shape the cumulative impact of mass communication on public agendas.

Cross-lag Data

Stone (1975) provides empirical support for the time lag originally selected for the 1972 Charlotte voter study. In the absence of any theoretical specification of what the appropriate time lag should be, that study also used a combination of intuition and the convenience of the calendar in deciding upon interviews with a panel of voters in June and October. Fortunately, as the Stone data now leads us to believe, that four-month lag is a reasonably appropriate one for cross-lagged correlational

analysis. And as we shall see, some rather striking answers about the agenda-setting process are emerging from the analysis.

The array of information generated in each cross-lagged analysis is again illustrated in Figure VII, which uses the agendas of the Charlotte Observer for June and October and the agendas for those same months of those Charlotte voters who indicated that the Observer was the only newspaper they read. In this initial analysis the evidence is quite clear. The agenda-setting relationship (Newspaper at Time One correlated with Voters at Time Two) is substantially stronger than the alternative hypothesis (Voters at Time One correlated with the Newspaper at Time Two). The rank-order correlations (Spearman's rho) based on the seven key issues in 1972 are +.51 versus +.19, a difference of .32 between the two.*

Furthermore, this across-time correlation between the newspaper agenda and the voters' agenda is stronger than either of the synchronous (same-time) correlations between newspaper and voter agendas. That is, the newspaper agenda of political issues in June is a better predictor of the voters' agenda in October than it is of the voters' agenda in June.

*While the "n" used to calculate the rank-order correlations is only 7, the number of major issues on the agenda, the correlation coefficients are far more stable than this n suggests because the issue rankings are based on the responses of 178 voters and over 200 newspaper items in each month analyzed. In short, the 7 issues are observation points at which data on large numbers of cases (voters or news stories) is aggregated.

Similarly, the June newspaper agenda is a better predictor than the October newspaper agenda of how the voters rank the issues in October. These comparisons of the across-time agenda-setting correlation with the static June and October agenda-setting correlations are further evidence of the causal influence of the media on voters' perceptions of the key issues over time.

These two comparisons with the agenda-setting cross-lagged correlation taken from Figure VII are summarized in the first line of Table I. There we see that the agenda-setting cross-lag correlation coefficient does exceed the alternative cross-lag relationship (by +.32) and that the agenda-setting cross-lag coefficient also exceeds both of the synchronous agenda-setting co-efficients, being .05 points more than the larger of the two static, synchronous correlations. Table I also summarizes the results of two additional cross-lagged analyses which examine the agenda-setting role of television. In one, the cross-lagged analysis matched the CBS agenda in June and October against the agenda of voters who reported using CBS as their regular source of news. In the other, the same cross-lagged analysis was repeated for NBC and NBC viewers.

Unlike the analysis of newspaper influence across time, the television data does not yield any patterns of agenda-setting across time. In both cases the correlation of TV at Time One with Voters at Time Two is weaker than the obverse, Voters at Time One with TV at Time Two. Furthermore, the cross-lagged agenda-setting correlation is weaker than either of the synchronous correlations between the voters' agenda and the TV agenda. For example, CBS in June correlates only +.30 with Voters in October. But in June the CBS/Voters correlation is +.32 and in October the match is +.77.

In short, once an appropriate time lag has been identified for analysis, some unequivocal evidence about the agenda-setting role of the press begins to emerge. As we see here in the cross-lagged analysis, there is striking evidence of a long-term effect of the newspaper on voters' agendas. In line with a scattering of other evidence in the agenda-setting literature, this effect seems to be absent for television news. Additional evidence presented elsewhere (Shaw and McCombs, in preparation) demonstrates that the newspaper and TV patterns in Table I hold when a variety of controls are applied and also demonstrates a short-term agenda-setting role for television.

Conclusions

Within the framework of agenda-setting research, this paper has demonstrated the need for more precise theorizing, as well as more precise methodology, for detecting and specifying causal relationships in nonexperimental settings.

As illustrated here, specification of an appropriate time lag is especially important when using a longitudinal study design and cross-lagged correlation. Our paper has illustrated one technique for empirically identifying the appropriate time lag and aiding in the development of agenda-setting theory by specifying the lag. The emphasis here is on the theoretical and empirical steps that must precede fruitful use of cross-lagged correlation as much as, or even more than, on the application of the cross-lagged correlation technique itself.

To further refine the agenda-setting theory of media effects, evidence has been presented which tentatively indicates that the appropriate time lag between cause and effect (between presentation of a press agenda and learning of issue saliences) is from two to six months, with a four-month lag being generally acceptable for newspaper agenda-setting. A shorter lag appears more appropriate for television agenda-setting.

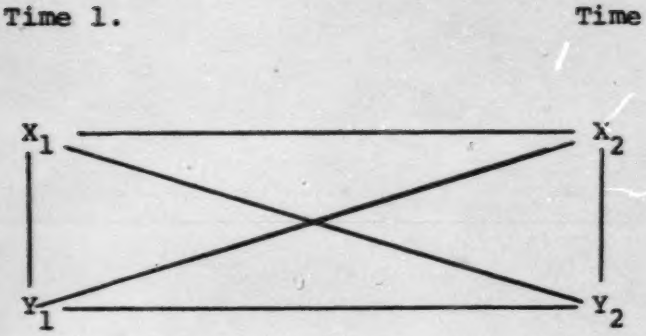
Although evidence has been provided bearing on the assumptions of non-instantaneous effects and the interval

for effects, there are still unanswered questions about the constancy of the relationships and about the situational factors affecting the process, including the types of issues on the public agenda and the other forces (such as interpersonal communication) at work on voters' agendas.

Further research should focus on specifying the causal process suggested in the agenda-setting theory of media effects, as well as on developing new methods for measuring and relating media and public issue agendas.

In building communication theory, agenda-setting or otherwise, we need to keep in mind the requirements of our methods as well as the needs of our field.

Figure I



The correlations between X_1 and Y_1 and between X_2 and Y_2 are called simultaneous or synchronous. The correlations between X_1 and X_2 and between Y_1 and Y_2 are called simple lagged correlations or test-retest correlations. The correlations between X_1 and Y_2 and between Y_1 and X_2 are cross-lagged correlations.

Figure II

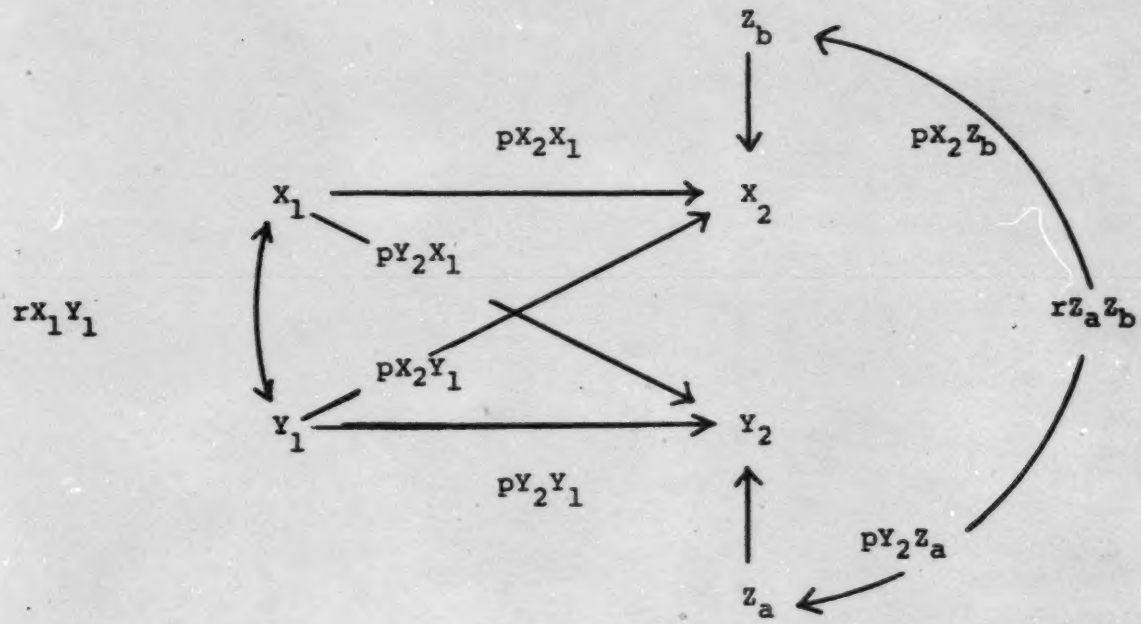

Z_b
pX_2X_1
pX_2Z_b
X_1
X_2
pY_2X_1
rX_1Y_1
rZ_aZ_b
pX_2Y_1
Y_1
Y_2
pY_2Y_1
pY_2Z_a
Z_a

Figure III

Assumptions Needed for Cross-Lagged Correlation
and Path Analysis Over Time

I. Statistical Assumptions

A. Equal interval measurement
B. Linearity
C. Normal distribution
D. Homoscedasticity
E. Lack of autocorrelation

II. Inherent Logic of Cross-Lagged Comparisons

A. Ongoing relationships
B. Non-instantaneous effects
C. Approximately equal intervals for effects of variables
D. Nature of the relationships must be static
E. Linearity of relationships (redundant with I B)

III. Additional Assumptions Required for Path Analysis Over Time

A. Non colinearity
B. Constancy of relationships (redundant with II A and II D)
C. Equivalence of causal relationships
D. Equal time lags (redundant with II C)
E. Absence of measurement error
F. Independence of disturbance terms

FIGURE IV: Sophomore Data

Correlations with agenda by monthly periods before and after interview period.

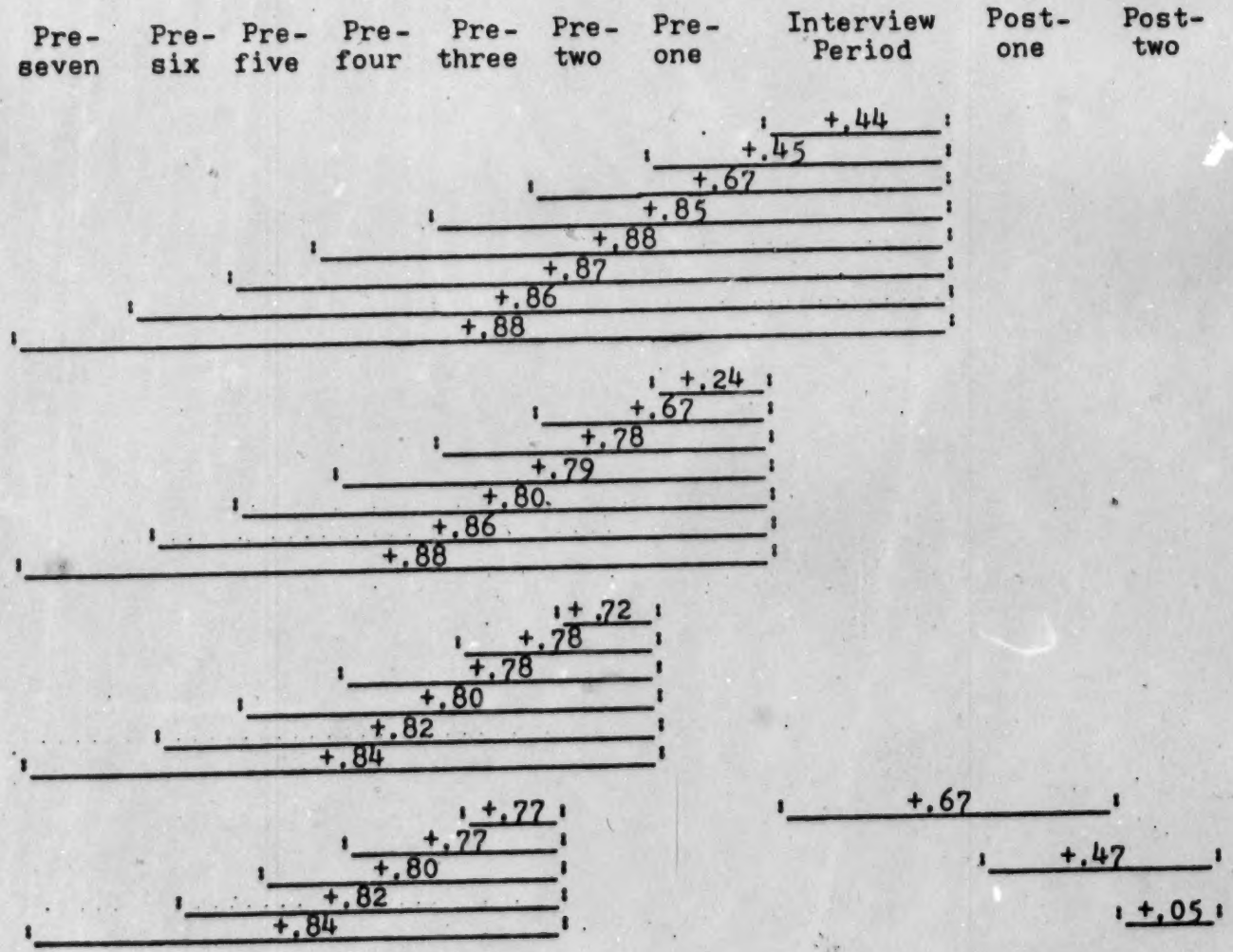


FIGURE V: Charlotte Data--June

Correlations with agenda by monthly periods before and after interviews.

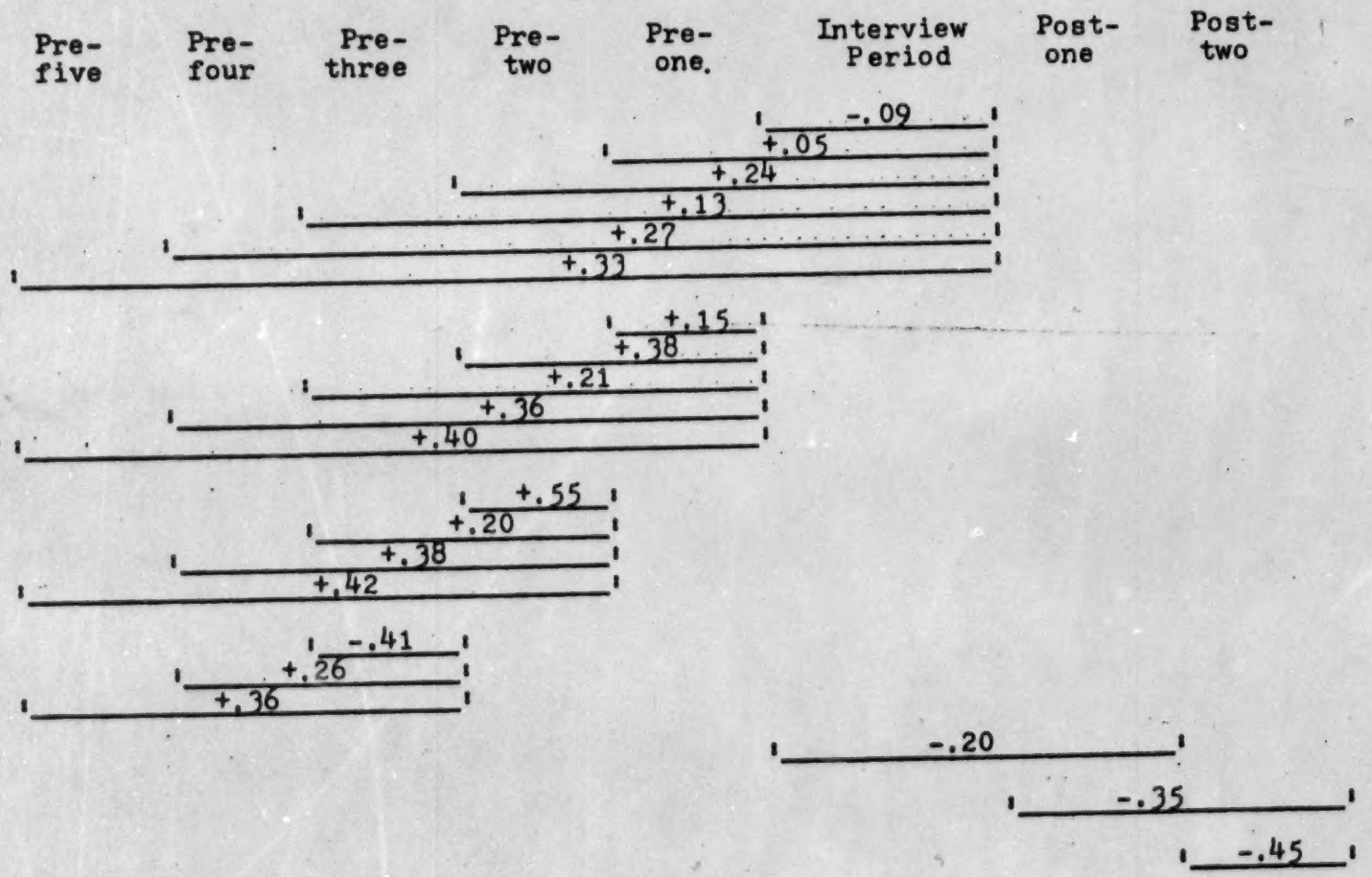


FIGURE VI: Charlotte Data -- October

Correlations with agenda by monthly periods before and after interviews.

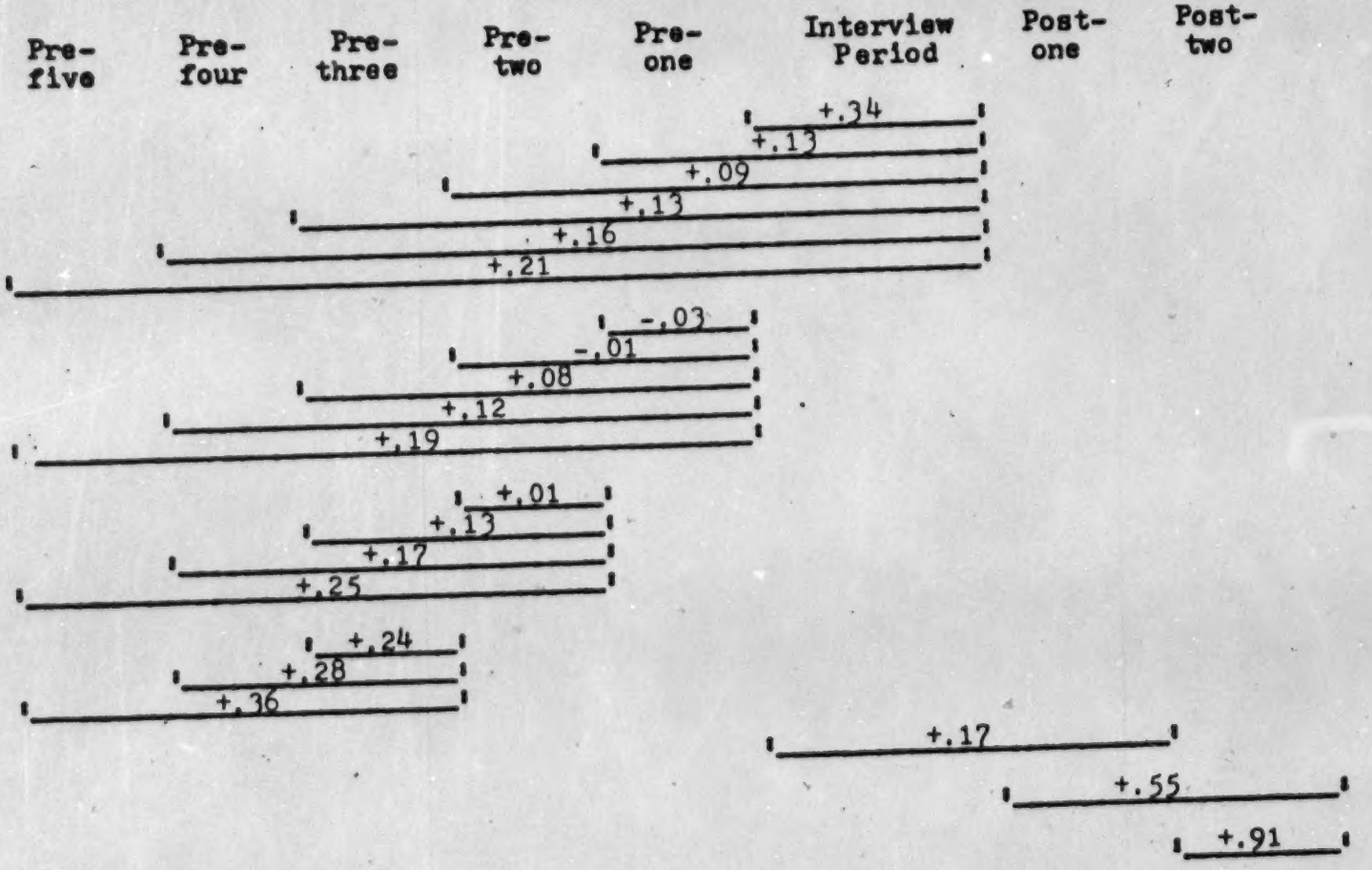
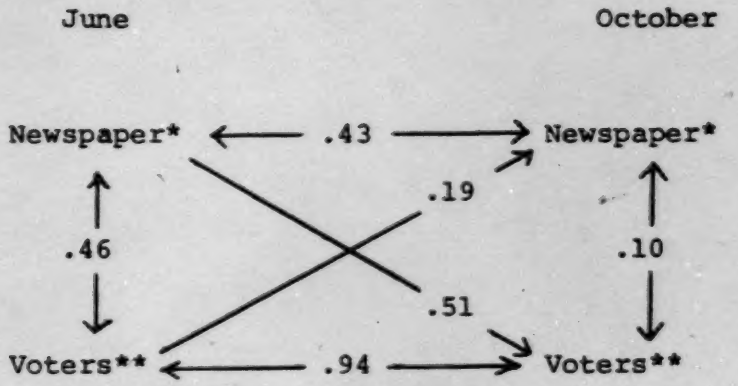


Figure VII: Cross-lagged correlation comparison of Charlotte Voters and the Charlotte Observer in June and October 1972.



*The newspaper agenda used here is based on a content analysis of all content except advertising for the month shown.

**Analysis based on only those panel members who read only the Charlotte Observer (N=178).

Table I. Cross-lagged correlation comparisons of Charlotte voter agendas and various mass media agendas in June and October 1972.

Voter Group	Is Media ⟶ Voters > Voters ⟶ Media		Cross-lag > Synchronous	
A. Charlotte Observer readers	Yes	+.32*	Yes	+.05
B. CBS viewers	No	-.31**	No	-.02
C. NBC viewers	No	-.52**	No	-.20

* The Media ⟶ Voters cross-lag exceeds the baseline correlation, while the Voter ⟶ Media cross-lag does not. For details on computing the baseline (value expected by chance) see Leonard Tipton et al., "Media Agenda-Setting in City and State Election Campaigns," Journalism Quarterly, 52 (1975): 15-22.

** The Voter ⟶ Media cross-lag exceeds the baseline correlation, while the Media ⟶ Voter (agenda-setting) cross-lag does not.

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